Recreation Use of the Ocala National Forest

in Florida

by

George A. James and Robert A. Harper

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WILDLIFE   FOOD AND COVER FOR GAME AND
RECREATION   OUTDOOR ACTIVITIES FOR EVERYONE TO
FOREST SERVICE
DEPARTMENT OF AGRICULTURE

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Forest land managers charged with operating and developing an outdoor recreation complex--whether large or small, public or private-- constantly face a host of management decisions. What are my cleanup and maintenance needs? What uses and facilities should be provided? Should I expand? Should I add new units? These questions are not easy to answer. And before sound judgments can be made, it is necessary to determine approximately how much and what kind of recreation use the area is receiving.

Two principal types of forest recreation use are generally recognized: mass use and dispersed use. The one which occurs on developed sites--areas provided with picnic tables, fireplaces, sanitary facilities, and the like--is commonly referred to as mass recreation use because of its concentrated nature. The other, which occurs on large, contiguous areas of forest land that normally contains little or no facility development (other than roads and trails), is usually designated as dispersed recreation use. Examples of dispersed uses include hunting, fishing, hiking, and driving for pleasure.

Numerous techniques have been tested for estimating mass recreation use, and several have been quite successful. Studies by Marcus et al. (1961), James and Ripley (1963), Bury and Hall (1963), Bury (1964), and Wagar (1964) are noteworthy.

Studies to measure dispersed recreation use on forested lands have received far less attention than recreation use measurement on developed sites. Robson (1960) and Overton and Finkner (1960) reported on sampling concepts and procedures for estimating total and component types of dispersed recreation uses, such as hunting and fishing.

The simple outdoor pleasures--hiking, swimming, hunting, fishing, and camping--
are ones Americans seek most.

A study conducted in 1961-62 by Cushwa and McGinnes (1963) to estimate dispersed recreation use on a 100-square-mile portion of the George Washington National Forest in Virginia demonstrated that acceptable estimates could be obtained using a stratified random sampling plan. Their study area contained 18 exits from which recreationists could leave the Forest. The subsequent question, however, whether acceptable estimates of mass and dispersed types of recreation uses could be economically obtained from a large National Forest still was not answered. Could an area, for example, having several hundred square miles, and containing several hundred exits, be effectively sampled?

This study reports on a pilot test to estimate both mass and dispersed recreation use on a complex, heavily-used National Forest. Sampling procedures largely worked out in simpler situations were tested for a difficult sampling situation. The basic sampling plan used in the Virginia effort to estimate dispersed recreation use was modified, and a 1-year study was conducted on the Ocala National Forest. In addition, a regression model tested by James and Ripley (op. cit.) was used to estimate mass recreation use on heavily-used, unattended sites. Collectively, these methods provided a simultaneous test of techniques specified to yield acceptable estimates of all recreation use on the Ocala, and at the same time provided data on the users.

THE STUDY AREA

The Ocala National Forest, containing approximately 671 square miles,[2] is located in north-central Florida and provides opportunities for recreation of many kinds. The two Ranger Districts which comprise the Forest--Seminole and Lake George--contain more than 20,000 acres of lakes and ponds, over 150 miles of rivers, 14 developed sites, 12 widely used undeveloped sites, 162 residence sites, and 5 sites for organization-sponsored recreational activities. The Forest offers some of the finest bass fishing waters in the United States. Big-game and small-game hunting is excellent. Travelers from every state in the Nation, plus many from foreign lands, visit the Ocala National Forest.

Two state highways, Florida 19 and 40, cut across the Forest and offer excellent access to the Forest from several nearby metropolitan areas. An internal network of approximately 500 miles of paved and graded roads provides additional access to the many and varied recreation attractions (fig. 1).

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[2] 361,029 publicly-owned acres within an exterior boundary of 429,210 acres.

	Camping	Picnicking	Swimming	Water Skiing	Fishing	Hunting	Trailer Camping	Boating
Lake Delancy	X	X			X	X		X
Juniper Springs	X	X	X		X	X	X	X
Mill Dam	X	X	X	X	X	X	X	X
Johnson Field	X	X			X	X		
Alexander Springs	X	X	X		X	X	X	X
Lake Dorr	X	X	X	X	X			X
Fore Lake	X	X	X	X	X			X
Wildcat Lake		X	X	X	X			X
Sellers Lake		X	X	X	X			X
Clearwater Lake	X	X	X		X	X		X
Juniper Creek		X			X	X		X

LEGEND

- National Forest Boundary
- Wildlife Management Area
- Game Refuge
- Paved Roads
- Secondary Roads
- ○ Towns
- ▲ Lookout Towers
- labeled Federal Highway
- ○ State Highway
- ▢ Forest Service Roads

OCALA National Forest
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FLORIDA
1964

Figure 1.--Recreation sites and road network on the Ocala National Forest, Florida.

PROCEDURES AND TECHNIQUES

Two sampling models were employed over a 1-year period to measure visits and visitor hours of use: double-sampling and stratified random sampling. The double-sampling technique was used on three heavily used developed recreation sites (Alexander Springs on the Seminole Ranger District, and Mill Dam and Juniper Springs on the Lake George Ranger District) from May 15, 1963, to May 14, 1964. This technique entailed developing a ratio between the desired statistic (visits, total recreation use, etc.) and traffic counts by simultaneously measuring both. Pneumatic traffic counters were placed at the entrances of the three developed sites to tally total vehicle crossings. The counters were read daily during the sample year. The number of people visiting the area and the use levels on recreational facilities were determined hourly during a 12-hour period on 20 randomly selected sampling days during the year. Ten of these samples were taken during the summer (high use) season (May 15 - September 2, 1963) and 10 during the off (low use) season (September 3, 1963 - May 14, 1964). Half the samples were taken during weekends and holidays, and half during weekdays. Detailed instructions for using the double-sampling technique are reported by James and Ripley (op. cit.).

Simple stratified random sampling, which entailed interviewing visitors as they left the respective Ranger District at established roadblocks, was employed to measure all other use of the entire Forest, including use on all developed sites except the three covered by double-sampling. Independent estimates were obtained for each of the two Ranger Districts for a sampling year extending from April 1, 1963, to March 31, 1964.

Total sampling opportunity, based on sampling all exits 24 hours each day during the entire sampling year, was 2,969,640 hours (339 exits x 24 hours x 365 days). This type of total census is, of course, so difficult and expensive that it is impractical. Desired limits of accuracy and cost of sampling were paramount in deciding how many sampling units were to be taken. Because no presampling had been done to determine coefficients of variation and sample size, it was necessary to base sampling intensity on recommendations made by Cushwa and McGinnes. Using their formula, which defined the relationship between number of sampling units and expected error limits, we calculated that approximately 240 samples per District would be needed to meet our specifications. To assure sampling adequacy in the event some units were missed during the year, a total of 275 samples was drawn for each District (actually, the number of units missed during the year because of sickness, firefighting activities, etc., was only 12 on the Seminole and 10 on the Lake George District).

Sampling effort was allocated in approximate proportion to expected recreation use; stratification was dictated by the following criteria: exits of heavy, moderate, and light expected use; type of exit; high, moderate, and low use periods; time of day; and day of week.
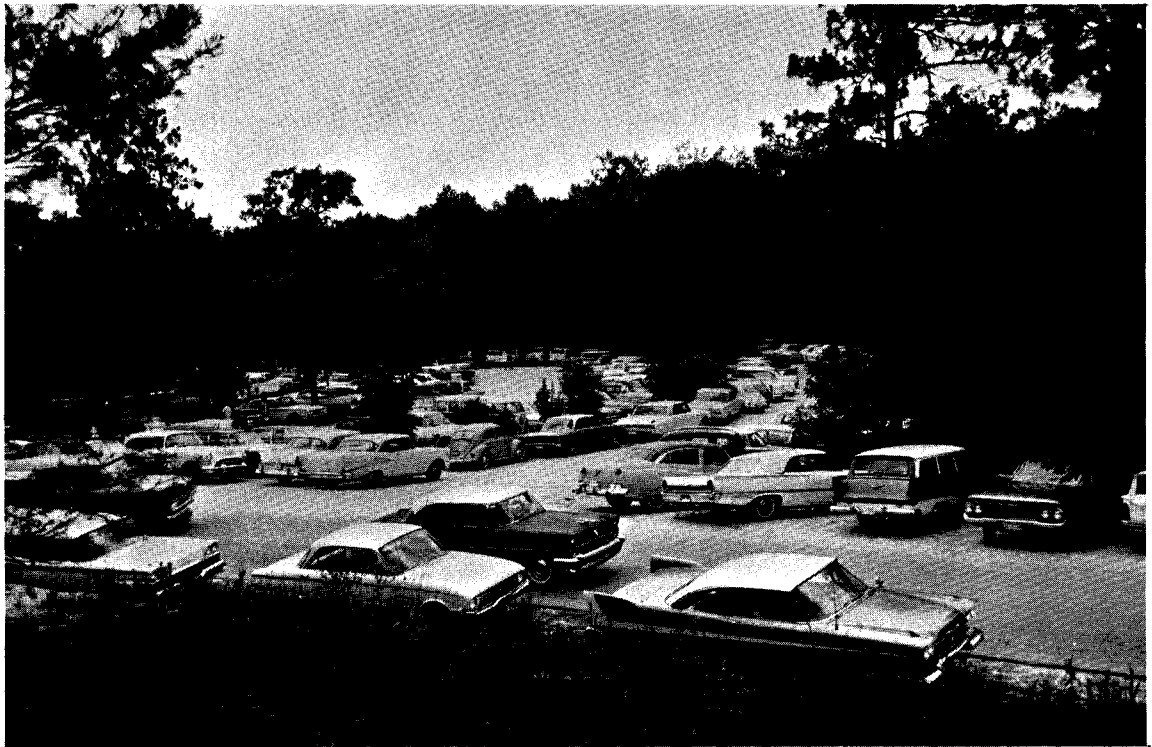
The information obtained by the yearlong sampling study of recreation use on the Ocala National Forest is extremely valuable. For example, it will tell the forest manager how many parking spaces must be provided (above), and what capacity sewage treatment plant is needed on heavily-used developed sites (such as the one shown below at Alexander Springs).
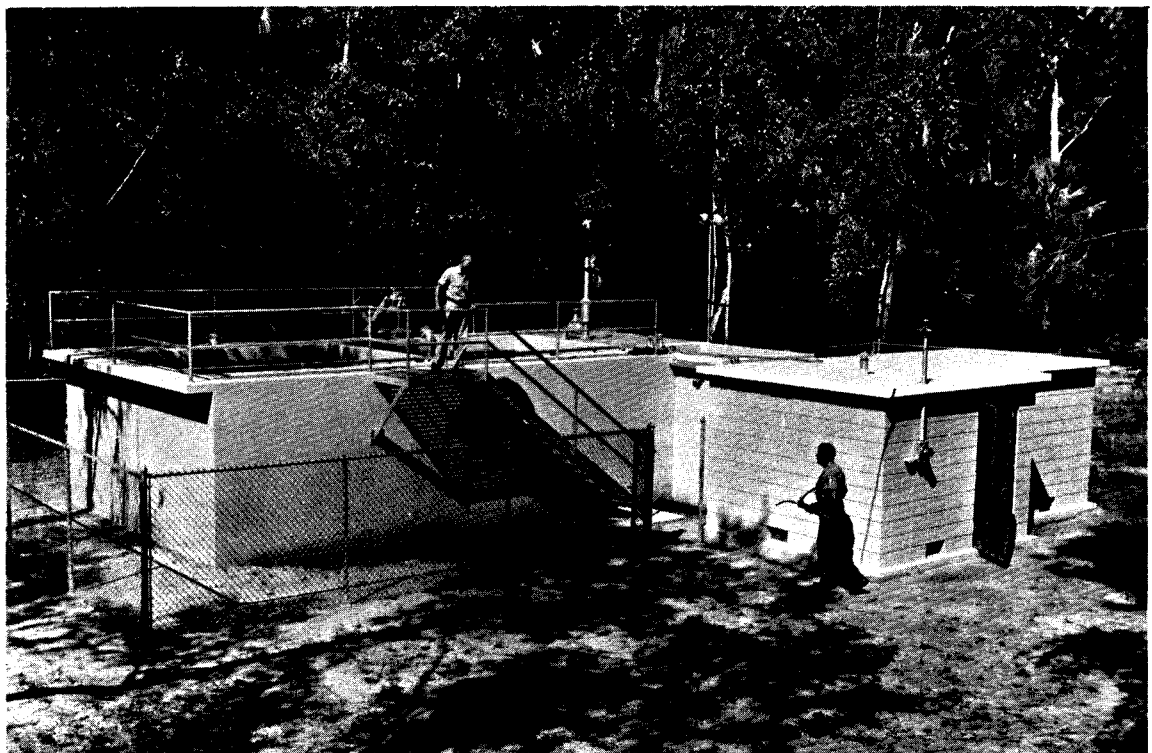
Stratification		Number of strata
Exit class	Class A (high use)	
	Class B (moderate use)	3
	Class C (low use)	
Exit type	Peripheral (P)	2
	Interior (I)	
Expected use period	High	
	Moderate	3
	Low	
Time of day	Day	2
	Night	
Day of week	Weekend/holiday	2
	Weekday	
Total strata (3 x 2 x 3 x 2 x 2)		72

Experience has shown that certain strata receive little or no use during the year. An example is nighttime use on Class C (low use) roads during low expected use periods. Accordingly, all strata classes which were expected to receive little or no use were not sampled. Only 56 of the possible 72 strata classes were actually sampled (appendix tables 1 and 2). The small bias introduced would only tend to underestimate slightly the number of visits and visitor hours of use.

First, all exits were examined and classified according to the amount of use they were likely to receive during the sampling year. Three exit classes were established:

Class A exits--high expected use
Class B exits--moderate expected use
Class C exits--low expected use

Length of sampling period (length of time a roadblock was manned) varied between exit class: 2 hours on Class A and Class B exits, and 4 hours on Class C exits.[3]

It was neither safe nor practical to establish roadblocks on the several heavily used, high-speed State roads located on the Ocala National Forest, and roadblock sampling was necessarily limited to the low-speed Forest Service roads. Further stratification of road exits was necessary. Exits which moved visitors off the respective District were called peripheral exits; road intersections which did not necessarily move visitors directly off the respective District were called interior exits. Sampling allocation was based on a 1:1 ratio of peripheral to interior exits on the Seminole District, and on a 3:7 ratio on the Lake George District (appendix table 3).

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[3] Sampling period length was adjusted inversely to the expected flow of traffic because of anticipated differences in the number of parties leaving per unit of time by type of exit.

Recreationists spent over $7\frac{1}{2}$ million hours camping on developed and undeveloped areas. This was the highest single use, comprising almost one-third of all recreational activity on the Ocala National Forest.

The yearlong sampling period was stratified into three use classes--high, moderate, and low--based on expected intensity. For example, the high-use period included the summer vacation period, opening days of the hunting and fishing seasons, etc. (appendix table 4).

Time-of-day stratification was made to obtain use estimates during daytime and nighttime hours. The hours of sunrise and sunset were the controlling factors in this stratification, and the strata from which sampling units were drawn varied in length during different seasons of the year (appendix table 5).

One further time stratification, based on day of week, was made to obtain use estimates for weekdays vs. weekends and holidays.

A sampling calendar, showing where and when each sample was to be taken, was prepared for each District by randomly selecting the designated number of sampling units in each strata class.

A roadblock was used at the scheduled exit and was manned for the designated period of time; i.e., 2 hours on Class A and Class B exits, and 4 hours on Class C exits. The position of roadblocks on all exits was carefully chosen to allow motorists ample warning. Three portable caution signs were erected at each roadblock. Two were placed approximately 100 yards on either side of the roadblock. A third was erected at the checkpoint, facing traffic leaving the area. These signs, made according to Florida Highway Department specifications, were covered with reflective material to insure better visibility. Because this study was designed to operate 24 hours a day, a light stand powered by a portable generator was used at night. As an added precautionary measure, a battery-powered, yellow blinker light was placed on each caution sign facing traffic leaving the area.

Forest Service personnel interviewed someone from each household represented in every car that exited during the sampling period. Primarily, the interview was designed to obtain information concerning how much and what kind of use each household made of the Forest. In addition, a number of personal questions were asked in order to characterize the socioeconomic status of each household represented in an exiting party[4] (see appendix figure 1).

Because parties leaving interior exits might or might not be planning to leave the respective Ranger District, it was first necessary to determine their immediate destination. A questionnaire was completed only on visitors planning to leave the respective District immediately. A complete questionnaire was obtained from all households who had devoted part or all of their time since their last entry into the Forest to some recreational pursuit. Only a few questions were asked if the exiting party had devoted all of their time in commercial, residential, or other non-recreational activity.

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[4] Socioeconomic relationships are not discussed in this report. A separate report will be prepared covering this phase.

During the interview, each exiting household was asked how much time they had spent at Alexander Springs, Mill Dam, or Juniper Springs, depending on the Ranger District involved. Recreation use on these sites was not included in the questionnaire totals because estimates of this use were obtained by the double-sampling procedure.

ANALYSIS OF DATA

Multiple regression analyses were performed to generate recreation visit and use estimates on the three heavily used developed sites. Detailed analytical procedures are described by James and Ripley (op. cit.).

In our stratified random sampling, the following formulae (Cochran 1953) were used to compute means, estimates, variances, and standard errors of estimates for each type of use sampled by individual stratum:

(a) Stratum mean, $\frac{\Sigma X}{n}$, where ΣX = sum of visits or man-hours use during all sampling units in an individual stratum.

n = total number of samples taken in individual stratum.

(b) Stratum total, $N \frac{\Sigma X}{n}$, where N = total number of sampling units available for sampling in individual stratum. N is product of (P) and (R), where (P) = number of sample periods available, and (R) = number of exits.

(c) Variance of the mean, $\dfrac{\Sigma X^2 - \dfrac{(\Sigma X)^2}{n}}{n(n-1)}$

(d) Variance of total estimate for stratum, $N^2 \left[\dfrac{\Sigma X^2 - \dfrac{(\Sigma X)^2}{n}}{n(n-1)} \right]$

(e) Standard error of the estimate, $\sqrt{N^2 \left[\dfrac{\Sigma X^2 - \dfrac{(\Sigma X)^2}{n}}{n(n-1)} \right]}$

Use data recorded on questionnaires for each exiting household were edited and summarized for each sampling period on an edit-punch form. The data were punched on standard IBM cards, and the analyses run on an IBM 7072 computer.

RESULTS AND DISCUSSION

Number of Visits

The estimate of total visits is the sum of visits to developed sites (determined by double-sampling) and visits to all other portions of each District (from stratified random sampling). Duplication of counting was avoided by asking all exiting parties at the time of interview whether they had visited one or more of the developed sites, depending on the Ranger District involved. These reported visits were subtracted from total visits to eliminate duplication between sampling models.

Over 1 million visits were estimated on the Seminole District, and almost $\frac{1}{2}$ million on the Lake George District (table 1). Number of visits on each District cannot be added to provide an unbiased estimate of total visits to the entire Ocala National Forest because some duplication in number of visits may result. As an example, persons were classified as bona fide visitors to a respective District once they exited that District boundary, whether through interior or peripheral exits. It was possible, therefore, for a person to be tallied as a visitor to the Seminole District and then possibly tallied again as a visitor to the Lake George District if he visited that District shortly thereafter and was again sampled upon exiting. The probability of being sampled in both Districts within a short period of time, however, was low.

Estimates of Visitor Hours

A regression model estimated recreation use on the three heavily used developed sites, and a stratified random sampling model gave us estimates of all other uses on each Ranger District.[5] It was necessary to determine from all exiting households, at time of interview, how much time they had spent at one or more of the developed sites, depending on the particular District involved. All time spent at the developed site was subtracted from total time spent on the District to prevent duplication of recreation use estimates between sampling models. Thus, we obtained independent estimates from each of the sampling models and estimates of use are directly additive.

Data from 881 completed questionnaires, plus estimates generated by double-sampling on the three developed sites, produced a total use estimate--recreation, commercial, residential, and other--of almost 29 million man-hours of use on the Ocala National Forest (tables 2, 3, 4, and 5). Of this total, 83.8 percent (24,212,639 man-hours) was devoted to some form of recreation; 11.4 percent (3,294,460 man-hours) to residential use; 4.7 percent (1,357,542 man-hours) to commercial use; and 0.1 percent (36,314 man-hours) to other use.

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[5] It should be noted that the yearlong sampling period differs slightly between sampling models; i.e., dispersed uses sampling was done from April 1, 1963, to March 31, 1964; double-sampling from May 15, 1963, to May 14, 1964. It is believed, however, that this minor difference in sampling dates has little or no effect on the combined yearlong estimates of visits and use.

Table 1.--Total estimates and errors for number of visits on two ranger districts,
Ocala National Forest

SEMINOLE RANGER DISTRICT

Area	Expected use period	Visits	Error at 67-percent confidence level
		Number	Percent
Alexander Springs	High use[1]	91,169	3.0
Alexander Springs	Low use[2]	28,107	12.6
Seminole	High use[3]	629,007	
Seminole	Moderate use[3]	218,301	11.7
Seminole	Low use[3]	63,714	
Total		1,030,298	

LAKE GEORGE RANGER DISTRICT

Mill Dam	High use[1]	24,495	3.0
Mill Dam	Low use[2]	14,959	2.5
Juniper Springs	High use[1]	66,897	2.0
Juniper Springs	Low use[2]	59,543	2.5
Camp Kiwanis	High use[3]	1,390	
Lake George	High use[3]	188,612	
Lake George	Moderate use[3]	74,863	15.5
Lake George	Low use[3]	46,603	
Total		477,362	

[1] May 15 - September 2, 1963.
[2] September 3, 1963 - May 14, 1964.
[3] See appendix table 4.

Seasonal Distribution of Visits and Recreation Use

The data were analyzed to determine the distribution of visits and recreation use during the periods of expected use upon which sampling was based; namely, heavy and light expected use seasons on the three developed sites, and high, moderate, and low expected use periods on all portions of the Forest.

Most recreationists visited the Ocala during the high expected use periods; i.e., during the summer vacation period and during the hunting and fishing seasons. Sixty-four percent of all visits to the three developed sites, and 67 percent of visits to all other areas, occurred during the high expected use periods. A considerable number of recreationists, however, visited the Ocala other than during the high use period (table 6).

Sheer enjoyment in the winter sun; a family picnic.

Table 2.--Total estimates and errors for each type of use sampled on the
Seminole Ranger District, Ocala National Forest

Type of use	Man-hours of use		Error at 67-percent confidence level
	- - - - - Number - - - - -		Percent
COMMERCIAL		260,615	26.5
RESIDENTIAL		3,050,897	28.0
OTHER		6,804	100.0
RECREATION (Total)		15,490,233	28.4
Alexander Springs	1,322,149		6.7
Recreation residences	2,261,084		43.2
Developed area[1]			
camping	2,387,518		28.4
picnicking	308,763		32.3
swimming	557,507		45.3
boating	0		--
fishing	271,585		38.6
nature study	0		--
sightseeing	122,389		46.0
hiking	4,896		100.0
other	62,541		65.6
Subtotal	3,715,199		26.4
Undeveloped area			
camping	2,278,750		76.0
picnicking	130,754		45.7
swimming	361,203		55.6
boating	6,408		76.6
fishing	2,169,237		28.6
hunting	2,225,206		62.8
nature study	12,420		100.0
sightseeing	1,007,460		26.2
hiking	0		--
other	363		100.0
Subtotal	8,191,801		40.2
Grand total, all uses		18,808,549	

[1] Excluding recreation use on Alexander Springs.

Table 3.--Total estimates and errors for each type of use sampled on the
Lake George Ranger District, Ocala National Forest

Type of use	Man-hours of use		Error at 67-percent confidence level
	- - - - - Number - - - - -		Percent
COMMERCIAL		1,096,927	83.7
RESIDENTIAL		243,563	36.9
OTHER		29,510	37.4
RECREATION (Total)		8,722,406	35.4
Juniper Springs	1,046,988		2.0
Mill Dam	594,576		4.4
Camp Kiwanis[1]	99,105		--
Recreation residences	5,118,756		40.1
Developed area[2]			
camping	474,062		55.7
picnicking	9,753		75.8
swimming	296		100.0
boating	0		--
fishing	75,409		75.6
nature study	3,324		100.0
sightseeing	3,061		71.7
hiking	296		100.0
other	16,955		95.9
Subtotal	583,156		48.5
Undeveloped area			
camping	90,858		71.0
picnicking	7,383		71.0
swimming	5,283		73.0
boating	5,169		76.0
fishing	213,069		35.5
hunting	807,483		49.7
nature study	58,369		68.9
sightseeing	90,213		48.4
hiking	0		--
other	1,998		100.0
Subtotal	1,279,825		34.6
Grand total, all uses		10,092,406	

[1] Estimate based on permittee registration records.
[2] Excluding recreation use on Juniper Springs, Mill Dam, and Camp Kiwanis.

Table 4.--Total estimates and errors for each type of use sampled for the entire
Ocala National Forest (both districts combined)

Type of use	Man-hours of use		Error at 67-percent confidence level
	- - - - - Number - - - - -		Percent
COMMERCIAL		1,357,542	67.8
RESIDENTIAL		3,294,460	26.1
OTHER		36,314	35.7
RECREATION (Total)		24,212,639	22.2
Alexander Springs	1,322,149		6.7
Juniper Springs	1,046,988		2.0
Mill Dam	594,576		4.4
Camp Kiwanis	99,105		--
Recreation residences	7,379,840		30.8
Developed area[1]			
camping	2,861,580		25.4
picnicking	318,516		31.4
swimming	557,803		45.3
boating	0		--
fishing	346,994		34.4
nature study	3,324		100.0
sightseeing	125,450		44.9
hiking	5,192		94.5
other	79,496		55.5
Subtotal	4,298,355		23.8
Undeveloped area			
camping	2,369,608		73.2
picnicking	138,137		43.4
swimming	366,486		54.8
boating	11,577		54.5
fishing	2,382,306		26.2
hunting	3,032,689		47.9
nature study	70,789		59.5
sightseeing	1,097,673		24.4
hiking	0		--
other	2,361		85.0
Subtotal	9,471,626		35.0
Grand total, all uses		28,900,955	

[1] Excluding recreation use on Alexander Springs, Juniper Springs, Mill Dam, and
Camp Kiwanis.

Table 5.--Estimates and associated error terms for recreation visit and use estimates at
Alexander Springs, Juniper Springs, Mill Dam, Ocala National Forest,
May 15, 1963, to May 14, 1964

Type of use	Alexander Springs		Juniper Springs		Mill Dam	
	Estimate	Accuracy[1]	Estimate	Accuracy[1]	Estimate	Accuracy[1]
	Hours	Percent	Hours	Percent	Hours	Percent
Camping use	779,050	11.0	538,324	2.0	301,981	6.0
	294,998	4.6	274,588	1.9	199,023	2.7
Picnicking use	35,160	9.0	17,831	7.0	4,010	8.0
	5,237	28.6	22,011	6.5	1,905	6.7
Swimming use	109,355	4.0	50,557	1.0	37,294	6.0
	0	--	14,589	6.9	8,997	6.2
Boating-fishing use	12,599	8.0	5,870	8.0	6,417	5.0
	3,100	27.2	5,731	7.2	3,850	5.8
Miscellaneous use	56,832	--	62,431	3.0	15,888	4.0
	26,367	20.7	54,937	2.7	15,213	6.4
Total recreation use[2]	992,996	8.0	675,125	2.0	365,588	6.0
	329,153	5.3	371,863	1.9	228,988	2.8
	Number	Percent	Number	Percent	Number	Percent
Total visits	[3]91,169	3.0	66,897	2.0	24,495	3.0
	[4]28,107	12.6	59,543	2.5	14,959	2.5

[1] Percent error at 67-percent confidence level.
[2] Minor differences may exist between total use estimate and sum of all component uses due to rounding errors.
[3] Heavy-use season, period May 15 to September 2, 1963.
[4] Low-use season, period September 3, 1963, to May 14, 1964.

The seasonal distribution of recreation use, as expected, followed a pattern similar to visitation, with 69 percent on the three developed sites and 82 percent on all other portions of the Forest occurring during the high expected use season. Considerable recreation use, roughly 5 or 6 million man-hours, occurred during the moderate and low expected use periods (table 6).

Precise estimates of number of visits and amount of recreation use by season are not important or meaningful. What is important, however, is a knowledge of the approximate magnitude of use which occurs at times other than during the summer vacation period, or during hunting and fishing seasons, because recreation areas receiving moderately heavy use during fall and winter months must receive continuing service and maintenance. With the possible exception of a few northern recreation areas equipped with facilities for winter sports, this is a problem of unique concern to recreation managers in areas of mild winters.

Table 6.--Distribution of visits and recreation use during expected use periods,[1] Ocala National Forest, April 1, 1963, to March 31, 1964

SEMINOLE RANGER DISTRICT

Expected use period	Visits		Developed sites		Undeveloped sites		Recreation residences		Total	
	Number	Percent	Man-hours	Percent	Man-hours	Percent	Man-hours	Percent	Man-hours	Percent
High	629,007	69	2,691,531	72	7,098,104	87	2,043,746	90	11,833,381	84
Moderate	218,301	24	983,924	27	843,605	10	61,380	3	1,888,909	13
Low	63,714	7	39,744	1	250,092	3	155,958	7	445,794	3
Total	911,022	100	3,715,199	100	8,191,801	100	2,261,084	100	14,168,084	100

LAKE GEORGE RANGER DISTRICT

Expected use period	Visits		Developed sites		Undeveloped sites		Recreation residences		Total	
	Number	Percent	Man-hours	Percent	Man-hours	Percent	Man-hours	Percent	Man-hours	Percent
High	188,612	61	463,603	81	1,094,750	85	4,000,734	78	5,559,087	80
Moderate	74,863	24	107,495	19	162,343	13	1,074,401	21	1,344,239	19
Low	46,603	15	2,058	0	22,732	2	43,621	1	68,411	1
Total	310,078	100	573,156	100	1,279,825	100	5,118,756	100	6,971,737	100

OCALA NATIONAL FOREST[2]

Expected use period	Visits		Developed sites		Undeveloped sites		Recreation residences		Total	
	Number	Percent	Man-hours	Percent	Man-hours	Percent	Man-hours	Percent	Man-hours	Percent
High	817,619	67	3,155,134	74	8,192,854	86	6,044,480	82	17,392,468	82
Moderate	293,164	24	1,091,419	25	1,005,948	11	1,135,781	15	3,233,148	15
Low	110,317	9	41,802	1	272,824	3	199,579	3	514,205	3
Total	1,221,100	100	4,288,355	100	9,471,626	100	7,379,840	100	21,139,821	100

[1] Does not include visits or recreation use at Alexander Springs, Juniper Springs, Mill Dam, and Camp Kiwanis.
[2] Both Ranger Districts combined.

CONCLUSIONS

The intensive yearlong sampling effort cost approximately $15,000; $5,000 for estimates of mass recreation use, and $10,000 for estimates of dispersed recreation use. A first reaction to this price tag might be that it was too expensive. A close look at what the expenditure actually bought, however, may dispel such fears.

Sampling the heavy, concentrated recreation use at Alexander Springs, Mill Dam, and Juniper Springs was most rewarding. Very precise estimates were obtained for all types of use investigated. It is thought that relationships established from this sampling effort can be used to provide estimates for several years from vehicle counts only. Prorated over a 5-year period, annual sampling costs run about $1,000 for all three sites, or approximately $350 per site.

The estimates of dispersed recreation use from the stratified random sampling model have provided us with a close approximation of the number of visitors to, and amount of use on, the Ocala National Forest during the 1-year sampling period. The results can be likened to a timber cruise where the end product is an estimate of current volume. The stratified random sampling effort has, however, provided more than just an estimate of current use. We have obtained a considerable amount of additional information about the forest user. The personal interviews obtained from recreationists as they left the Forest will tell us who our customers are, and where they come from. This information is of vital concern to recreation managers, and is perhaps even more important than knowing how much and what kind of recreation use occurs.

It is apparent from the George Washington and Ocala National Forests sampling studies, however, that precise estimates of dispersed recreational activities, such as hunting, boating, hiking, fishing, and others cannot be obtained by low-intensity sampling. Precise estimates of these varied uses can only be obtained by substantially increasing the total number of samples to be taken. Sampling is costly, however, and practical limits are soon reached. But are precise estimates of these activities really needed? The estimates obtained by the stratified random sampling model, even though accuracy may be less than desired, are still of considerable value to the recreation manager. They are very useful in assessing the relative magnitude of component recreation use.

A serious limitation inherent in the use of the stratified random sampling model stems from its inability to predict visits and use in future years. But this is not an insurmountable problem, and the probable answer lies in developing some suitable, but highly complex, multiple variant model on which future estimates can be based. This is not a simple matter. It may be possible that continuous traffic count records from several key forest roads, together with other important indicators, might provide the "missing link." This important phase in the development of prediction models needs further investigation.
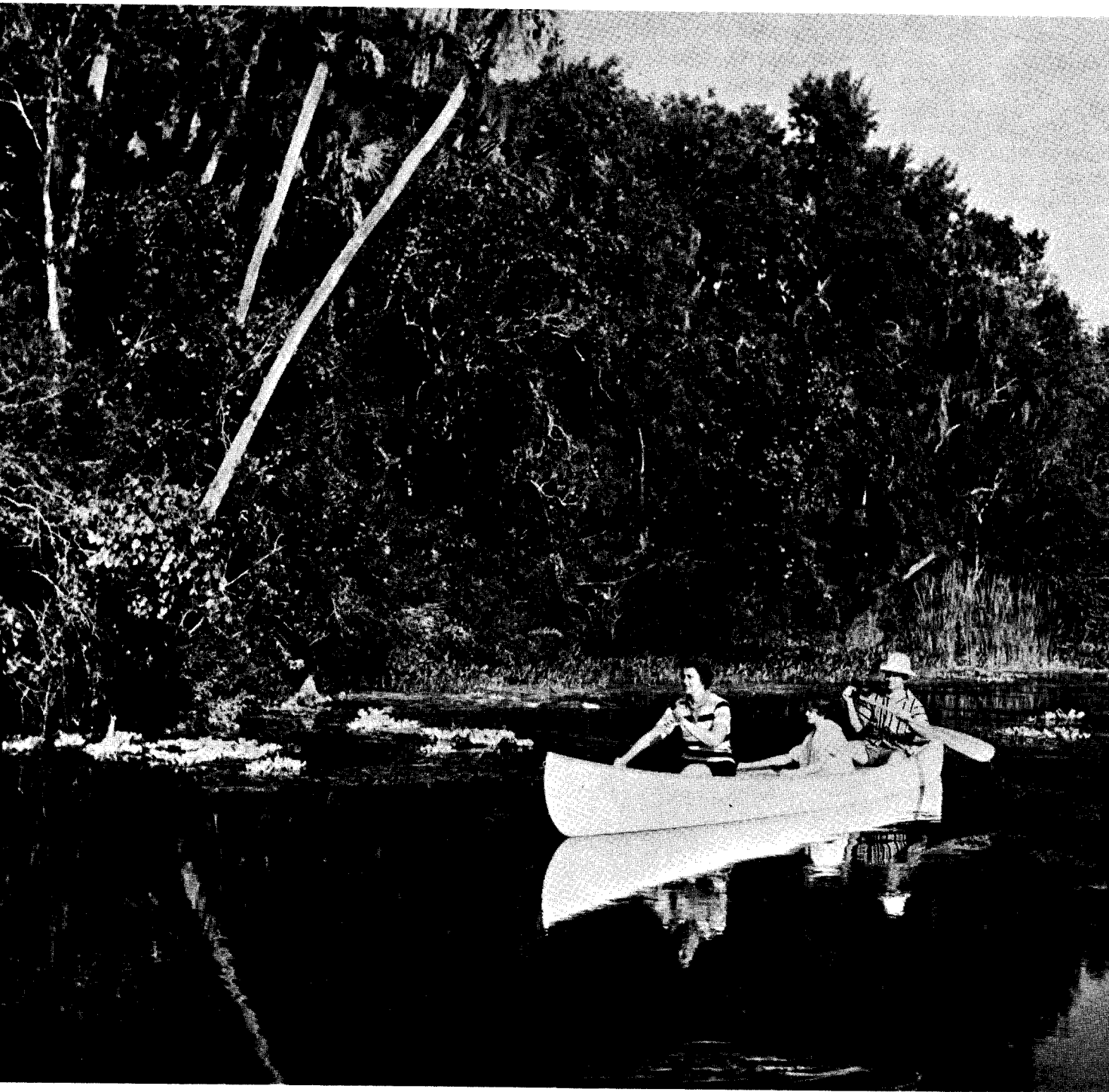
The Ocala National Forest contains more than 20,000 acres of lakes and ponds, and 150 miles of river. Water-oriented activities, such as boating, swimming, and fishing, received almost 4 million hours of use.

The Ocala National Forest was selected for the sampling study because of its large size, intricate road network, and the seemingly endless hours of sampling opportunity available. It was a tough test. If the basic sampling techniques worked on this Forest, they could be expected to work on practically any other recreation unit. The two sampling techniques, used simultaneously, worked well, and it appears that only slight modifications need be made in the stratified random sampling plan to accommodate almost any combination of area size and road network pattern.

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APPENDIX

A view of the swimming area at Alexander Springs. This area received almost 10 percent of the 1,200,000 hours of swimming use on the Ocala National Forest.

Appendix table 1.--Allocation of sampling effort, by District, Ocala National Forest

Period of week	Period of day	Exit class	Seminole Ranger District — High (No. of sampling units)	Seminole High (Man-hours)	Seminole Moderate (units)	Seminole Moderate (Man-hours)	Seminole Low (units)	Seminole Low (Man-hours)	Seminole Total (units)	Seminole Total (Man-hours)	Lake George — High (units)	Lake George High (Man-hours)	Lake George Moderate (units)	Lake George Moderate (Man-hours)	Lake George Low (units)	Lake George Low (Man-hours)	Lake George Total (units)	Lake George Total (Man-hours)
Weekend-Holiday	Day	A_I	11	22	8	16	4	8	23	46	18	36	10	20	5	10	33	66
		A_P	11	22	6	12	4	8	21	42	8	16	5	10	3	6	16	32
		B_I	17	34	4	8	3	6	24	48	21	42	6	12	4	8	31	62
		B_P	15	30	4	8	3	6	22	44	10	20	2	4	2	4	14	28
		C_I	6	24	3	12	0	0	9	36	8	32	2	8	0	0	10	40
		C_P	5	20	2	8	0	0	7	28	3	12	2	8	0	0	5	20
	Night	A_I	3	6	3	6	0	0	6	12	4	8	3	6	0	0	7	14
		A_P	3	6	1	2	0	0	4	8	2	4	2	4	0	0	4	8
		B_I	3	6	3	6	0	0	6	12	2	4	3	6	0	0	5	10
		B_P	2	4	2	4	0	0	4	8	2	4	2	4	0	0	4	8
		C_I	2	8	3	12	0	0	5	20	3	12	3	12	0	0	6	24
		C_P	2	8	2	8	0	0	4	16	1	4	2	8	0	0	3	12
Weekday	Day	A_I	22	44	6	12	4	8	32	64	28	56	8	16	5	10	41	82
		A_P	20	40	5	10	4	8	29	58	12	24	4	8	2	4	18	36
		B_I	6	12	3	6	3	6	12	24	8	16	4	8	4	8	16	32
		B_P	5	10	3	6	3	6	11	22	3	6	2	4	2	4	7	14
		C_I	6	24	3	12	0	0	9	36	7	28	2	8	0	0	9	36
		C_P	4	16	2	8	0	0	6	24	3	12	2	8	0	0	5	20
	Night	A_I	3	6	3	6	0	0	6	12	4	8	3	6	0	0	7	14
		A_P	2	4	2	4	0	0	4	8	2	4	2	4	0	0	4	8
		B_I	2	4	3	6	0	0	5	10	3	6	3	6	0	0	6	12
		B_P	2	4	2	4	0	0	4	8	2	4	2	4	0	0	4	8
		C_I	3	12	3	12	0	0	6	24	3	12	3	12	0	0	6	24
		C_P	2	8	2	8	0	0	4	16	2	8	2	8	0	0	4	16
Total			157	374	78	196	28	56	263	626	159	378	79	194	27	54	265	626

Appendix table 2.--Allocation of sampling effort, by strata, Ocala National Forest

Period of week	Period of day	Exit class	Expected use period			
			High	Moderate	Low	Total
			- - - - - - - - - - Percent - - - - - - - - - - -			
Weekends-Holidays	Day	A	9.0	5.6	2.9	17.5
		B	12.0	2.9	2.2	17.1
		C	4.1	1.8	0	5.9
	Night	A	2.2	1.8	0	4.0
		B	1.8	1.8	0	3.6
		C	1.5	1.8	0	3.3
Weekdays	Day	A	15.7	4.4	2.9	23.0
		B	4.1	2.2	2.2	8.5
		C	4.1	1.8	0	5.9
	Night	A	2.2	1.8	0	4.0
		B	1.8	1.8	0	3.6
		C	1.8	1.8	0	3.6
Total			60.3	29.5	10.2	100.0

Appendix table 3.--Summary of road exits by Ranger District, Ocala National Forest

Exit class	District	
	Seminole[1]	Lake George[2]
	- - - Number - - -	
A_I[3]	12	16
A_P[4]	18	2
B_I	29	22
B_P	16	3
C_I	62	116
C_P	35	8
Total	172	167

[1] Does not include Alexander Springs exit.
[2] Does not include exits from Mill Dam and Juniper Springs.
[3] Indicates interior exit.
[4] Indicates peripheral exit.

Appendix table 4.--Recreation use periods,
Ocala National Forest

Classification	Inclusive dates	Length of period
High use	Jan. 1 - Jan. 6 Mar. 15 - April 30 June 15 - Labor Day Nov. 15 - Dec. 31	180 days
Moderate use	Jan. 7 - Mar. 14 May 1 - June 14	113 days
Low use	Sept. 3 - Nov. 14	73 days

Appendix table 5.--Time of day strata, Ocala National Forest

Season (date)	Exit classification	Sampling unit duration	Period of day	Hour of day[1]	Number of sampling opportunities per day
		Hours			
May 15 - Sept. 2, inclusive	A, B	2	Day	0700-2100	7
	C	4	Day	0900-2100	3
	A, B	2	Night	2100-0100	2
	C	4	Night	0500-0900; 2100-0100	2
Sept. 3 - May 14, inclusive	A, B	2	Day	0700-1900	6
	C	4	Day	0700-1900	3
	A, B	2	Night	1900-0100	3
	C	4	Night	1900-2300	1

[1] 24-hour time system.

STUDY OF DISPERSED RECREATION USE
(Completed by Interviewer)

Data obtained in this survey will be held confidential and used only for statistical purposes in combinations with data from other respondents.

Date _____   District _____

Time _____   Interviewer _____

Time of Interval Sampled _____   Mode of Travel _____

Exit Class _____   Size of Party:

Exit Number _____   Number of Households _____

Weather _____   Number of Individuals _____

ASK OF HEAD OR MEMBER OF EACH HOUSEHOLD (OR ORGANIZATION):

1. The person interviewed is:

   _____ the head of a household;
   _____ member but not head of a household.

2. Number of individuals represented by this questionnaire _____

3. How did you find out about this area (newspaper, travel agency, etc.)?

   _____

4. How long have you, or you and the household (or organization) members you represent, been in this area since your last entry? (Record aggregate total for all individuals represented by this questionnaire.)

   Days _____   Hours _____

5. Of the total time given in the preceding question, about what percent was devoted to each of the following activities?

	%
Recreation (playing, resting, etc.)	
Commercial (business, working)	
Residential (yearlong residence)	
Other (passing through)	
Total	100%

END INTERVIEW IF ALL TIME WAS SPENT IN COMMERCIAL, RESIDENTIAL OR OTHER ACTIVITY.

6. What percent of the total time devoted to recreation would you estimate that you, or you and the members of the group you represent, spent in?

	%
Developed areas (improved campgrounds; picnic areas, etc.)	
Underdeveloped areas (areas with no improvements)	
Total	100%

Appendix figure 1. -- The questionnaire used in the Ocala National Forest study.

SHOW CARD # ___1___

7. Will you tell me on what kinds of developed areas you spent the most time (limit maximum selection to 3)? What was the percent of total time spent on each?

%

Campgrounds _____
Picnic areas _____
Swimming or beach _____
Organized sports areas _____
Scenic overlooks _____
Monuments
Formal demonstrations _____
Other _____ _____
        (Specify)
        Total   100%

SHOW CARD # ___2___

8. What were your major activities while in the undeveloped areas (limit maximum selection to 3)? What percent of total time did you spend on each?

%

Camping _____
Picnicking _____
Nature study _____
Swimming _____
Fishing _____
Hunting _____
Hiking _____
Photography _____
Painting _____
Bird watching _____
Boating _____
Skiing _____
Skating _____
Sight-seeing _____
Other_____ _____
        (Specify)
        Total   100%

9. If you were fishing, what species of fish were you seeking, principally?

Trout _____
Bass _____
Pike, Pickerel, Muskellunge, etc. _____
Pan fish _____
Non-game fish _____
Amphibian (what_____) _____
Other_____
        (Specify)

10. If you are hunting, what species of game were you seeking, principally?

Deer _____
Bear _____
Turkey _____
Grouse _____
Quail _____
Squirrel _____
Rabbit _____
Raccoon _____
Opossum _____
Fox _____
Bobcat _____
Crow _____
Woodchuck _____
Ducks _____
Geese _____
Other_____ _____
        (Specify)

11. If hunting, what weapons were you using, principally?

Rifle _____
Shotgun _____
Bow _____
Other _____

12. In the past year, how many times did you (personally) visit this area?

_____ 1st time   _____ 2-5   _____ 6-10   _____ 10-20
_____ 20-50   _____ 50-100   _____ more than 100

13. What was the main purpose of most of your previous year's visits? (As in 8 above)

_____

How long did you usually stay? _____ days _____ hours.

Appendix figure 1.--(continued).

PERSONAL SECTION OF QUESTIONNAIRE

(All of the following questions apply only to the individual head-of-the household. Any or all questions may be answered or filled-in by respondent.)

14. Where do you live:

Town or City _____
County   _____
State   _____

15. How old are you? _____ years.

16. Are you married? _____ yes _____ no.

17. How many dependents do you have? _____

18. How many dependent children under 18 do you have? _____

19. What type of work or occupation provides the main source of income for your family?

_____

20. If you are a farmer:

    (a) What type of farm do you operate? _____
    (b) What is the total acreage of the farm? _____
    (c) What is the location of your farm? _____
        County_____ State_____

21. How many years of school have you completed?

Elementary School
(grade) 1 2 3 4 5 6 7 8

High School
(Year) 1 2 3 4

College
(Year) 1 2 3 4 5 6 or more

SHOW CARD # _____3_____

22. Will you tell me the letter of the groups into which the combined family annual income (before taxes) falls?

    a. ⬚ c. ⬚ e. ⬚ g. ⬚ i. ⬚
    b. ⬚ d. ⬚ f. ⬚ h. ⬚

Appendix figure 1. --(continued).